

P.R.GOVERNMENT COLLEGE (A), KAKINADA

I B.Sc. – Statistics / Semester- I (w.e.f 2020-21)

Course-I

Course Title: DESCRIPTIVE STATISTICS & PROBABILITY

Theory

Total Hrs. of Teaching: 60 @ 4 h / Week

Credits: 04

Objectives:

- This course gives the students to review good practice in presentation and format that most applicable to their own data.
 - The measures of central tendency or averages reduce the data to a single value which is highly useful for making comparative studies.
 - The measures of dispersion throw light on reliability of average and control of variability
 - This paper deals with the situation where there is uncertainty and how to measure that uncertainty by defining the probability, random variable and mathematical expectation which are essential in all research areas.
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Module-I (10 Hrs)

Introduction to Statistics: Concepts of primary and secondary data. Diagrammatic and graphical representation of data: Histogram, frequency polygon, Ogives, Pie. **Measures of Central Tendency:** Mean, Median, Mode, Geometric Mean and Harmonic Mean. Median and Mode through graph.

Module-II (10 Hrs)

Measures of Dispersion: Range, Quartile Deviation, Mean Deviation and Standard Deviation, Variance. Central and Non-Central moments and their inter-relations. Sheppard's correction for moments. Skewness and kurtosis.

Module-III (12 Hrs)

Introduction to Probability: Basic Concepts of Probability, random experiments, trial, outcome, sample space, event, mutually exclusive and exhaustive events, equally likely and favourable outcomes. Mathematical, Statistical, axiomatic definitions of probability. Conditional Probability and independence of events, Addition and multiplication theorems of probability for 2 and for n events. Boole's inequality and Baye's theorem and its applications in real life problems.

Module-IV (8 Hrs)

Random variable: Definition of random variable, discrete and continuous random variables, functions of random variable. Probability mass function. Probability density function, Distribution function and its properties. Simple Problems. Bi-variate random variable - meaning, joint, marginal and conditional Distributions, independence of random variables and simple problems.

Module-V (10 Hrs)

Mathematical Expectation : Mathematical expectation of a random variable and its Properties. Moments and covariance using mathematical expectation with examples. Addition and Multiplication theorems on expectation. Definitions of M.G.F, C.G.F, P.G.F, C.F and their properties. Chebyshev and Cauchy - Schwartz inequalities.

Co-Curricular Activities (10 Hours):

Problem Solving / Seminars / Assignments /Quiz /Group Discussions /Open Text Book Test /Oral test /Brain Storming

Text Books:

1. V.K.Kapoor and S.C.Gupta: Fundamentals of Mathematical Statistics,Sultan Chand & Sons, NewDelhi.
2. BA/BSc I year statistics - descriptive statistics, probability distribution - Telugu Academy- Dr M.JaganmohanRao,DrN.Srinivasa Rao, Dr P.Tirupathi Rao, Smt.D.Vijayalakshmi
3. K.V.S. Sarma: Statistics Made Simple: Do it yourself on PC. PHI

Reference books:

1. Willam Feller: Introduction to Probability theory and its applications. Volume –I,Wiley
2. Goon AM, Gupta MK, Das Gupta B : Fundamentals of Statistics , Vol-I, the World Press Pvt.Ltd.,Kolakota.
3. Hoel P.G: Introduction to mathematical statistics, Asia Publishinghouse.
4. M. JaganMohan Rao and Papa Rao: A Text book of StatisticsPaper-I.
5. Sanjay Arora and Bansi Lal: New Mathematical Statistics: Satya Prakashan , NewDelhi

Practicals-Course-I

Total Hrs. of Teaching: 30 @ 2 h / Week

Credits: 01

Conduct any SIX (MS-Excel mandatory):

1. Graphical presentation of data (Histogram, frequency polygon).
2. Construction of Ogive curves
3. Computation of measures of central tendency(Mean, Median and Mode)
4. Computation of measures of dispersion(Q.D, M.D and S.D)
5. Computation of non-central, central moments, β_1 and β_2 for ungrouped data.
6. Computation of non-central, central moments, β_1 and β_2 and Sheppard's corrections for grouped data.
7. Computation of Karl Pearson's coefficient of Skewness and Bowley's coefficient of Skewness.
8. Practicals 1, 2, 3, 4, 6, 7 using MS-Excel.

Note: Training shall be on establishing formulae in Excel cells and derive the results. The excel output shall be exported to MS word for writing inference.

SEMESTER-I: DESCRIPTIVE STATISTICS & PROBABILITY

Model blue print for the Question Paper setter

Max. marks: 60

Time: 2 ½ Hrs.

Module	Short Answer Questions	Essay Questions	Marks allotted to the Unit/Chapter
I	1	2	25
II	1	2	25
III	1	2	25
IV	1	1	15
V	2	1	20
Total including choice	6	8	110

Statistics Course–I: DESCRIPTIVE STATISTICS & PROBABILITY Question Bank

Short answer Questions:

1. Explain the construction of Ogives.
2. Write the merits and demerits of mode.
3. Show that the sum of absolute deviation from median is minimum.
4. Write about Sheppard's corrections.
5. Define Kurtosis and explain.
6. State and prove addition theorem of probability for two events.
7. State and prove multiplication theorem for two events.
8. Define Probability density function.
9. Define Probability mass function.
10. Define distribution function and state its properties.
11. Define Marginal and conditional distributions.

12. What is the chance that leap year selected at random will contain 53 Sundays.
13. A problem in statistics is given to the three students A,B and C whose chances of solving it are $1/2$, $3/4$ and $1/4$ respectively. What is the probability that the problem will be solved if all of them solve independently.
14. For a continuous random variable X with p.d.f. $f(x)=3x^2, 0 \leq x \leq 1$. Find a and b such that i) $p(X \leq a) = p(X > a)$ and ii) $p(X > b) = 0.05$
15. Define Mathematical Expectation of a random variable. State its properties?
16. State and prove addition theorem of expectation for 2 variables.
17. Define Characteristic function and state its properties.
18. Explain Cumulative generating function

ESSAY QUESTIONS:

19. Explain the various methods to collect primary data and the sources of secondary data.
20. Explain measures of central tendency.
21. Explain measures of dispersion.
22. Define central and non central moments and establish the relation between them.
23. Explain Karl Pearson's and Bowley's coefficient of Skewness.
24. State and prove addition theorem for n events.
25. State and prove multiplication theorem for n events.
26. State and prove Bayes's theorem.
27. State and prove Boole's inequality.
28. The first four moments about a point 4 are respectively 1, 4, 10 and 45. Find mean, variance, μ_3 and μ_4 .
29. A random variable X lies the following probability distributions

X:	0	1	2	3	4	5	6	7	8
P(X):	a	3a	5a	7a	9a	11a	13a	15a	17a

 Find the values of a) a b) $p(X < 3)$ c) $p(X \geq 3)$ d) $p(0 < X < 5)$ e) $p(X \leq 7)$
30. Suppose that the random variables X takes the values 3,4 and 5 with probabilities $1/2$, $1/6$ and $1/3$ respectively. Obtain distribution function of the random variable X.
31. State and prove Cauchy's Schwartz inequality.
32. State and prove Chebyshev's inequality.
33. Define Moment generating function and derive its properties.
34. Define Probability generating function and derive its properties.

P.R. Government College (Autonomous), Kakinada
I year B.Sc., Degree Examinations – Semester-I
Statistics Course–I: DESCRIPTIVE STATISTICS & PROBABILITY
Model Paper

Time: 2 ½ Hrs.

Max. Marks: 60

Section – A

Answer any four of the following questions.

4x5 = 20 M

1. Explain the construction of Ogives.
2. Show that the sum of absolute deviation from median is minimum
3. A problem in statistics is given to the three students A,B and C whose chances of solving it are $\frac{1}{2}$, $\frac{3}{4}$ and $\frac{1}{4}$ respectively. What is the probability that the problem will be solved if all of them solve independently.
4. For a continuous random variable X with p.d.f. $f(x)=3x^2, 0 \leq x \leq 1$. Find a and b such that i) $p(X \leq a) = p(X > a)$ and ii) $p(X > b) = 0.05$
5. State and prove additive property of mathematical expectation for 2 variables
6. Define moment generating function and state its properties.

Section – B

Answer any two questions

2x10 = 20 M

7. Explain the various methods of collecting primary data.
8. Explain measures of central tendency with their relative merits and demerits?
9. Define raw and central moments and establish relationship between them?
10. For the following data compute β_1 and β_2 ?

CI	0-5	5-10	10-15	15-20	20-25	25-30	30-35
F	2	6	8	10	8	6	2

Section – C

Answer any two questions

2x10 = 20 M

11. State and prove additive law of probability of n events.
12. State and prove Baye's theorem probability.
13. A random variable X lies the following probability distributions

X:	0	1	2	3	4	5	6	7	8
P(X):	a	3a	5a	7a	9a	11a	13a	15a	17a

Find the values of a) a b) $p(X < 3)$ c) $p(X \geq 3)$ d) $p(0 < X < 5)$ e) $p(X \leq 7)$

14. State and prove Chebyshev's inequality.

P.R.GOVERNMENT COLLEGE (A), KAKINADA

I B.Sc. – Statistics / Semester- II (w.e.f 2020-21)

Course- II

Course Title: PROBABILITY DISTRIBUTIONS & STATISTICAL METHODS

Theory

Total Hrs. of Teaching: 60 @ 4 h / Week

Credits: 03

Objectives:

- This course gives an idea of using various standard theoretical distributions, their chief characteristics and applications in analyzing any data.
 - The concept of Correlation and Linear Regression deals with studying the linear relationship between two or more variables, which is needed to analyze the real life problems.
 - The attributes gives an idea that how to deal with qualitative data.
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Module-I (10 Hrs)

Discrete Distributions: Binomial, Poisson, Negative Binomial, Geometric distributions: Definitions, means, variances, M.G.F, C.F, C.G.F, P.G.F, additive property if exists. Poisson approximation to Binomial distribution. Hyper-geometric distribution: Definition, mean and variance.

Module – II (12 Hrs)

Continuous Distributions: Rectangular, Exponential, Gamma, Beta Distributions: mean , variance, M.G.F, C.F. Normal Distribution: Definition, Importance, Properties, M.G.F, , additive property.

Module-III (12 Hrs)

Correlation: Meaning, Types of Correlation, Measures of Correlation: Scatter diagram, Karl Pearson's Coefficient of Correlation, Rank Correlation Coefficient (with and without ties), Bi-variate frequency distribution, correlation coefficient for bi-variate data and simple problems.

Regression: Concept of Regression, Linear Regression: Regression lines, Regression coefficients and it's properties, Regressions lines for bi-variate data and simple problems. Correlation vs Regression.

Module- IV (8 Hrs)

Curve fitting: Bi- variate data, Principle of least squares, fitting of degree polynomial. Fitting of straight line, Fitting of Second degree polynomial or parabola, Fitting of power curve and exponential curves.

Module-V (8 Hrs)

Attributes : Notations, Class, Order of class frequencies, Ultimate class frequencies, Consistency of data, Conditions for consistency of data for 2 and 3 attributes only , Independence of attributes , Association of attributes and its measures, Relationship between

association and colligation of attributes, Contingency table: Square contingency, Mean square contingency, Coefficient of mean square contingency, Tschuprow's coefficient of contingency.

Co-Curricular Activities (10 Hours):

Problem Solving / Seminars / Assignments /Quiz /Group Discussions /Open Text Book Test /Oral test /Brain Storming

Text Books:

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4. M. JaganMohan Rao and Papa Rao: A Text book of Statistics Paper-I.
5. Sanjay Arora and Bansilal: New Mathematical Statistics: Satya Prakashan , NewDelhi
6. Hogg Tanis Rao: Probability and Statistical Inference. 7thedition.Pearson.

Practicals – Course-II

Total Hrs. of Teaching: 30 @ 2 h / Week

Credits: 01

Conduct any TEN (MS-Excel mandatory):

1. Fitting of Binomial distribution – Direct Method.
2. Fitting of Binomial distribution – Recurrence Relation Method.
3. Fitting of Poisson distribution – Direct Method.
4. Fitting of Poisson distribution - Recurrence Relation Method.
5. Fitting of Negative Binomial distribution.
6. Fitting of Geometric distribution.
7. Fitting of Normal distribution – Areas Method.
8. Fitting of Normal distribution – Ordinates Method.
9. Fitting of Exponential distribution.
10. Fitting of straight line and parabola by the method of least squares
11. Fitting of exponential and power curves by the method of least squares.
12. Computation of correlation coefficient and regression lines for ungrouped data
13. Computation of correlation coefficient, forming regression lines for grouped data
14. Practical 1, 3, 7, 9, 10, 11, 12 using MS-Excel

Note: Training shall be on establishing formulae in Excel cells and derive the results. The excel output shall be exported to MS word for writing inference.

SEMESTER-II PROBABILITY DISTRIBUTIONS & STATISTICAL METHODS
Model blue print for the Question Paper setter

Max. marks: 60

Time : 2 ½ Hrs.

Module	Short Answer Questions	Essay Questions	Marks allotted to the Unit/Chapter
I	1	2	25
II	1	2	25
III	1	2	25
IV	1	1	15
V	2	1	20
Total including choice	6	8	110

Statistics- Course–II: PROBABILITY DISTRIBUTIONS & STATISTICAL METHODS

Question Bank

SHORT QUESTIONS:

1. Find m.g.f. of Binomial distribution.
2. Explain the memory less property of geometric distribution.
3. Obtain mean and variance of binomial distribution.
4. Obtain mean and variance of Poisson distribution.
5. Obtain mean and variance of rectangular distribution.
6. Obtain mean and variance of exponential distribution.
7. Obtain mean and variance of geometric distribution.
8. Define Normal Distribution and find MGF
9. Define correlation and write types of correlation.
10. Write the difference between correlation and regression.

11. Write the properties of regression coefficients.
12. Define principle of least squares and write the procedure to fit a straight line.
13. Define attribute and explain association of attributes.
14. Explain the criteria of independence of attributes

ESSAY QUESTIONS:

15. Define Hyper Geometric distribution, find its mean and variance.
16. Derive the recurrence relation for the moments of Binomial distribution.
17. Show that Poisson distribution is limiting case of binomial distribution.
18. In Normal distribution, show that mean = median = mode.
19. In Normal distribution, show that Q.D:MD:SD is approximately 10:12:15.
20. Define Gamma distribution, state and prove additive property of gamma distribution.
21. State and prove memoryless property of exponential distribution.
22. Derive mean and variance of Beta distribution of first kind.
23. Derive mean and variance of Beta distribution of second kind.
24. It is found that the average calls received by a lady at a particular helpline centre is 4 per hour. What is the probability that she will receive during a random hour i) no call ii) exactly 4 calls iii) at least one call.
25. In a normal distribution, 7% of items are under 35 and 89% of items are under 63. Find mean and variance of the distribution.
26. Show that the correlation coefficient is independent of change of origin and scale
27. Derive the two regression lines.
28. Obtain rank correlation for the following data.

X	45	55	52	71	84	66	74	42	49	58
Y	48	52	74	65	71	44	85	78	54	65
29. Explain fitting of exponential curve and power curve.
30. Fit a second degree parabola for the following data.

X	5	4	6	2	7	9	4
Y	6	7	4	8	4	1	8
31. Show that $Q = \frac{2Y}{1+Y^2}$?

P.R. Government College (Autonomous), Kakinada
I year B.Sc., Degree Examinations - II Semester
Statistics Course–II: PROBABILITY DISTRIBUTIONS & STATISTICAL METHODS
Model Paper

Time: 2 ½ Hrs.

Max. Marks: 60

Section – A

Answer any four of the following questions.

4x5 = 20 M

1. Find m.g.f. of Binomial distribution.
2. Explain the memory less property of geometric distribution.
3. Write the differences between correlation and regression
4. Explain the fitting of straight line
5. Explain the independence of attributes
6. Write the conditions of consistency for 3 attributes.

Section – B

Answer any two questions

2x10 = 20 M

7. Define Hyper Geometric distribution, find its mean and variance.
8. Show that Poisson distribution is a limiting form of Binomial distribution.
9. Define Normal Distribution and find MGF & hence reduce it's mean and variance.
10. Define Gamma distribution, state and prove additive property of gamma distribution.

Section – C

Answer any two questions

2x10 = 20 M

11. Show that Correlation coefficient is independent of change of origin and scale.
12. Estimate regression lines from the following data .?

X	16	12	18	4	3	10	5	12
Y	87	88	89	68	78	80	75	83

13. Explain the fitting of second degree parabola.

14. Show that $Q = \frac{2Y}{1+Y^2}$?